

### REMARKS

A summary of the differences between the claims and references follows in a chart.

There are two cited references, Innocenti and Jones.

Innocenti was cited against claims 1-3 under §102. Jones was cited with Innocenti against claims 4-20 under §103.

Innocenti describes a bottle 1 "... formed by an inner monolithic metal body 2 ...and by an outer composite material reinforcement 3...", col. 2 l. 24-28.

An optical fiber 4 includes "... a plurality of Bragg grating reflective elements  $S_1 \dots S_n$ ..."

An optical coupler 7 at one end connects a light source 6 and a detector 8 and processor 9, col. 3 l. 3-12. Before use the metal body is stressed to its yield point in "autofrettage".

Innocenti cannot anticipate (102) claims 1-3 because Innocenti does not have "... opposite ends exposed ..." (claim 1). Innocenti has only one end exposed.

Innocenti cannot anticipate claim 2 because Innocenti does not have ... spaced loops in a first helical direction ... and ... spaced loops in a second helical direction...

Jones describes color change sensed by at least first and second photo responsive elements and interpreting color change in terms of a parameter. See claims 1. The only parameter Jones describes is temperature or pressure. Nothing in Jones or Innocenti would have suggested their combination. Innocenti has a single end with Bragg grating reflectors. Jones has at least two photo-responsive elements at an opposite end of an optical fiber from a light source. Neither Jones nor Innocenti sense for tank volume control.

The invention as claimed has several new features which are noted in the chart which is part of this response.

Notably, in the present invention, the optical fibers are wrapped directly on the liner, which becomes the tank when the outer support filters are wrapped around the liner and optical fibers. Importantly and significantly, the optical fibers are fastened to the liner with adhesive, and the crossover points are fastened together with adhesive. The adhesive produces two unique results. The adhesive protects the fibers when handling the liner and placing it in the wrapping machine to create the tank. The adhesive also constrains the crossover points to produce a uniform signal upon liner expansion.

The termination of the optical fibers at the tank inlet and outlet allows in situ plugging in of an optical meter to test aircraft escape chute bottles and fire fighting equipment in place and scuba tanks and O<sub>2</sub> tanks as they are being filled.

Neither reference shows any of those features.

Claims		Differences	Innocenti	References	Jones
1	1	- optical fiber wound on tank - fiber opposite ends exposed for receiving and outputting light - covered	- optical fiber within composite material upon mfg. col. 2, l. 16 - same end 4 receives, outputs Braag reflections - imbedded		
2	1+	- wound in first and second helical direction	- wound in single direction		
3	1+	- covering is a filament winding	- imbedded		
4	1+	- optical fiber crosses over obstructions, forms bend	- no obstructions - no crossovers	- no tank - small solid cylinder Fig. 6 - small cyl. Fig. 5 around wire	
5	4+	- first and second spaced coils in opposite direction over tank	- no spaced coils	- no tank	
6	5+	- first and second coils secured to tank	- no spaced coils	- no tank - not secured	
7	5+	- flexible adhesive	- none	- none	
1	8	- tank - obstructions - securing pinch points - covering optical fiber	- no obstructions - no securing pinch points - no covering	- no obstruction - no securing pinch points - no covering	
9	8+	- winding optical fiber in first and second directions on a tank liner	- no first and second direction	- no tank liner	
10	9+	- covering optical fibers with isolator layer	- no isolator layer	- no isolator layer	
11	10+	- filament windings over an isolator layer	- no isolator layer	- no isolator layer	
12	9+	- coating with a settable adhesive	- no settable adhesive	- no settable adhesive	
13	9+	- coating pinch points with a flexible settable adhesive	- no flexible settable adhesive	- no flexible settable adhesive	
14	11+	11 + increasing pressure in tank increasing bending at pinch points	- no increasing pressure in tank increasing bending at pinch points		
1	15	- pressure tank - optical fiber secured on outer surface - optical fiber crossing on tank - composite material overwrap covering optical fiber - withstanding internal pressure resetting expansion of tank	- no optical fiber secured on outer surface - no crossing - no composite material overlap	- no tank - no optical fiber secured on outer surface of tank - no composite material overlap	
16	15+	- optical couplings at ends of the fibers secured to the inlet and outlet of the tank	- optical couplings not at inlet and outlet of tank	- no tank - optical couplings not at inlet and outlet of tank	
17	15+	- adhesive connecting optical fiber to outer surface of tank	- no adhesive	- no tank - no adhesive	
18	17+	- flexible adhesives at optical fiber bends	- no flexible adhesive	- no flexible adhesive	

Referring to the examiner's stated reasons for rejection beginning on page 2, the reasons are incorrect and not well based in the art.

Regarding claim 1, Innocenti EP '244 does not show "... the optical fiber having opposite ends exposed ..." There is only one end exposed (end 7) in Innocenti claim 1 should be allowed.

Regarding claim 2, Innocenti does not show "... optical fibers ... subsequently wound in spaced loops in a second helical direction ..."

There is but one direction in Innocenti. One end of the fiber 4 stops at the upper right of Figure 1. Nothing in Innocenti's text refers to winding in a second direction.

Regarding claim 3, Innocenti does not show "...the cover comprises a filament winding in a filament wound composite gas storage tank." Innocenti points out that his filament 4 is "... incorporated within the composite material layer 3 ..." (col. 2, l. 33-34)

There would have been no motivation in the prior art to combine Jones with Innocenti. Innocenti is from the field of high pressure gas bottles using Bragg reflectors on a single fiber with one exposed end. Jones is from the field of pressure mats, (col. 1, l. 24, Figs 1, 3 and 4) on anvils 7 and 20 and temperature sensors in anvils 9 and cylinders 9 in Figs 5 and 6.

Nothing in the references or in the prior art would have motivated the combination of those two references.

The examiner has argued that both are cylindrical objects, but that would not have motivated selecting Jones from the non tank art.

The examiner has argued that Jones measures changes in pressure  $P$ , but that is perpendicular force  $P$  on the anvil 20 in Figure 3 (col. , l. 17 Jones) or  $P$  on the fiber that rests on the anvil 7 in Figure 1 (col. 3, l. 48 Jones).

The examiner has argued that the glass fiber wounding 3 in Innocenti is a cover, but 3 is not a cover as described in Innocenti.

Innocenti states that the optical fibre is incorporated within the composite material layer 3 (Innocenti col 2., l. 32-33).

In the present invention it is important that the outer cover is the rigid part. "... The rigidity of the composite overwrap causes the overlapping fibers 41, 43 to pinch 11. (Application page 18, lines 7-8.) That is not found in either of the references.

The examiner has stated that "It would have been obvious to form bends in fiber around the tank of Innocenti as taught by Jones," but Jones does not teach that. Innocenti fiber 4 and the Bragg gratings 5 are incorporated within the composite material layer. There would have been no way to cross and pinch the fibers in Innocenti, and that would have done violence to the Innocenti teaching of the Bragg reflecting elements. Pinch points would have reduced the reflected light, rendering the Bragg gratings 5 useless.

With regards to the examiner's arguments concerning claims 7, 13 and 18, the examiner has made a statement of what is known in the art, without citing a reference. Applicant respectfully disagrees.

The particular experiments which led to the use of particular adhesives are stated on page 9 and Figure 8 of the application. Nothing like that exists in Innocenti or Jones or any prior art.

With regard to the examiners rejection of claim 4 on page 4 of the office action, there would have been no reason to combine Innocenti and Jones without using the present invention

as a guide. Moreover Jones would have invalidated the Innocenti Bragg gratings and rendered them useless.

With regard to the examiner's rejection of claim 5 on page 6 of the office action, there would have been no reason to combine Innocenti and Jones without using the present invention as a guide. Moreover Jones would have invalidated the Innocenti Bragg gratings and rendered them useless.

With regard to the examiner's rejection of claim 6 page 5 of the office action, Jones specifically shows that the coils are loosely positioned with respect to substrates. Innocenti has no second coils, and Innocenti's coils are not secured to the tank.

With regard to the examiner's rejection of claim 8 on page 3 of the office action, there would have been no motivation to combine Innocenti and Jones apart from the disclosure in the present invention. Moreover, if Innocenti and Jones were combined, that would do violence to Innocenti's teaching of Bragg gratings. There would have been no indication that pinch points and Bragg gratings would have worked together and no motivation to select and combine particular features and to avoid others.

Regarding the examiner's rejection of claim 9 on page 5 of the office action, there would have been no motivation to combine Innocenti and Jones apart from the disclosure in the present invention. Moreover, if Innocenti and Jones were combined, that would do violence to Innocenti's teaching of Bragg gratings. There would have been no indication that pinch points and Bragg gratings would have worked together and no motivation to select and combine particular features and to discard others.

Regarding the examiner's rejection of claim 10 on page 6 of the office action, neither Innocenti nor Jones suggests or teaches an isolator layer. The isolator layer 41 is an important

part of the invention, as shown in Figure 8 and as described on page 9 of the application. Layer 3 is not an isolator layer in Innocenti, because 3 is described as winding that incorporates the optical fiber. (Innocenti col. 2, l. 30-34)

Regarding the examiner's rejection of claim 11 on page 6 of the office action, neither references teaches an isolator layer and windings. Applicant objects to the citation of ordinary skill without citing references. The importance of the isolator layer and the windings over the isolator layer are described on page 9 and in Figure 8 of the application. No reference teaches that feature.

With regard to the rejection of claims 12 and 17 on page 6 of the office action, applicant objects to the holding of well known without citing art. Neither Innocenti nor Jones describes adhesive. The importance of the adhesive is described on page 9 and Figure 8 of the application and are not well known in the art.

With regard to the examiner's objection of claim 14 on page 6 of the office action, there would have been no reason to combine Innocenti and Jones without using the present invention as a guide. Moreover, Jones would have invalidated the Innocenti Bragg gratings and rendered them useless.

With regard to the rejection of claim 16 on page 7 of the office action, neither reference has optical couplings secured to the inlet and outlet of the tank. Securing the optical couplings to the inlet and outlet of the tank is one of the most important features of the invention as shown in Figures 14-26 and particularly in 16-18, 23 and 24 and as described on pages 12-14 of the specification. To reject that novel and unobvious feature without citing art does not meet a standard of proof and should not be maintained. Applicant traverses this and all of the holdings of obviousness without citing art.

Claims 19 and 20 have been cancelled.

The invention is new and unobvious. New and unobviousness features of the invention are specifically pointed out in claims 1-18.

Applicant has traversed with particularity the features held to be obvious without citing art.

The prior art does not show or suggest the new and unobvious features of the invention. There would have been no motivation to combine the two references apart from the present disclosure.

Applicant objects to and traverses the statements beginning with "It would have been obvious" at:

Page 2, line 4 from bottom:

Nothing in the art would have made it obvious to squeeze cross over patents between a tank liner and a strengthening wrap to diminish through light output from a fiber with pressure increase.

Beginning:

"It is known ..." on page 3, line 6. It is not known in the art to secure a fiber for measurement. Innocenti embeds his fiber. It would not have been obvious to secure Jones, because Jones is always shown loose.

"It would have been obvious ..." page 3, line 13 and page 4, lines 2 and 10. It could not have been obvious to replace Innocenti's fiber with Jones' fiber on a tank line. Innocenti's fiber is embedded. Neither is secured to a tank liner.

"It is known in the art ..." page 5, line 10. No securing of a fiber for measuring has been shown or is known.

"It would have been obvious ..." page 5, line 11. Securing at least part of a fiber is not shown in either references.



"It is known in the art ..." page 5, line 16. Nothing in the art shows securing a fiber with a flexible adhesive.

"It would have been obvious ..." page 5, line 17. Nothing in the art shows securing a fiber with a flexible adhesive.

"It is known in the art ..." page 6, line 11. Particular layering structures are not known in the art over fibers.

"It would have been obvious ..." page 6, line 12. Particular layering structures are not known in the art over fibers.

"It is known in the art ..." page 6, line 16. To use particular adhesive is not known in the art.

"it would have been obvious ..." page 6, line 17. To use particular adhesive is not known in the art.

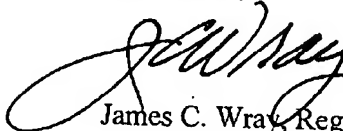
"It is known in the art ..." page 7, line 6. It is not known in the art to use or secure a coupling at a location.

"It would have been obvious ..." page 7, line 7. It is not known in the art to use or secure a coupling at a location.

### CONCLUSION

Reconsideration and allowance are requested.

Respectfully,



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